

E. coli O157:H7

A Brief History of a Dangerous Pathogen

Escherichia coli O157:H7 has presented a series of mysteries for scientists, with the first clues dating back 43 years. Hemolytic uremic syndrome (HUS) was first recognized in 1955 as a triad of hemolytic anemia, low platelet counts, and partial or complete kidney failure. Its cause was unknown, but HUS was often identified after a severe diarrheal illness.

Not until 1982 were cases of bloody diarrhea associated with eating fast-food hamburgers. The cause of the outbreak was eventually traced to a new pathogen, the O157:H7 strain of *E. coli*, which in 1985 was linked to post-diarrheal HUS. Following outbreaks in Washington State in 1986, including one with 35 cases and two deaths, the state made the disease reportable.

The number of *E. coli* O157:H7 cases averaged about 275 a year from 1988 through 1992, with a total of three deaths over that period. Five years ago, during January and February 1993, the nation's largest outbreak of *E. coli* O157:H7 illness occurred in Washington. Eventually traced to undercooked hamburgers served at a multistate fast-food chain, the outbreak resulted in 501 cases and three deaths. More recently, about 170 cases have been reported annually in the state.

E. coli O157:H7, also called verotoxin-producing *E. coli* (VTEC), or Shiga-like toxin (SLT) producing *E. coli*, is among the few strains of *E. coli* that are pathogenic in humans. It is the most common enterohemorrhagic *E. coli* strain.

The spectrum of illness associated with *E. coli* O157:H7 varies considerably. The organism has been cultured from asymptomatic persons. However, a typical course of illness begins three to five days after exposure; symptoms include diarrhea and severe abdominal cramps, sometimes accompanied by vomiting, nausea, and a low fever. After two to three days, the disease may progress to hemorrhagic colitis that ranges from bloody streaks to frank bloody diarrhea. Other than HUS, complications of *E. coli* O157:H7 infection are thrombotic thrombocytopenic purpura, intestinal or neurologic complications, and diabetes mellitus due to pancreatic damage. A small percentage of cases are fatal. Children and the elderly seem more susceptible to infection and complications.

E. coli O157:H7 is not identified on routine stool culture and in some laboratories testing must be specifically requested. Negative cultures may result if the stool

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Controlling *E. coli* O157:H7

Prevention begins at home.

- Cook meat and poultry completely.
- Purchase pasteurized milk and juices.

Physicians initiate the investigations.

- Report suspected cases promptly to the local health department.
- Obtain cultures for bloody diarrhea; specify testing for *E. coli* O157:H7.
- Educate patients to prevent secondary transmission.
- If a patient with diarrhea works as a food handler, urge the patient not to work.

Clinical laboratory participation is essential.

- Identify sorbitol-negative or O157 isolates.
- Submit isolates to the State Public Health Laboratories for further typing.

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sample is taken late in the course of the infection, for example when complications occur.

Beef products, particularly ground beef, are the most commonly reported foods in *E. coli* O157:H7 outbreaks. In response to the president's Food Safety Initiative and the Pathogen Reduction Plan, the U.S. Department of Agriculture (USDA) has radically changed the procedures for meat inspection. On January 28 the federal government instituted a system that emphasizes preventing contamination of meat and poultry rather than monitoring for problems. Processing plants will install preventive measures to reduce bacterial contamination and improve sanitation, with a focus on steps where contamination is most likely to occur. The USDA also will do random testing for the pathogen.

Other foods associated with outbreaks of *E. coli* illness include raw milk, apple cider, and alfalfa sprouts, presumably through fecal cross-contamination. In 1996 a regional outbreak associated with commercial apple juice resulted in 70 cases, more than half in children less than five years of age. Outbreaks have also been associated with drinking water, swimming

in natural waters, and person-to-person transmission. Cases peak during the summer months, perhaps due to outdoor cooking of hamburgers.

E. coli O157:H7 can survive freezing, but is destroyed by heat. Meat and particularly ground beef should be cooked completely, milk and cider should be pasteurized, and handwashing is always advised to prevent fecal-oral transmission of infections, including with *E. coli* O157:H7. Given that the organism can persist in the intestine for more than a month after illness, prolonged adherence to these precautions is especially important in household and day care settings where a case has been identified.

New laboratory methods allow genetic fingerprinting of *E. coli* O157:H7. Methods such as pulsed field gel electrophoresis can characterize *E. coli* O157:H7 isolates and aid in the identification of related cases and exposure sources. When matching patterns are found, local health departments can concentrate the investigation on the identified cluster of cases. Outbreaks can easily escape detection, so it is important for laboratories to submit all isolates associated with bloody diarrhea to the State Public Health Laboratories.

Please see WWW Tips on page 4 for Web sites on *E. coli* O157:H7.

Reference Sources

Bell PB, Goldoft M, Griffin PM, Davis MA, et al: A multistate outbreak of *Escherichia coli* O157:H7-associated bloody diarrhea and hemolytic uremic syndrome from hamburgers. *JAMA* 1994; 272:1349-1353.

Davis M, et al: Update: Multistate outbreak of *Escherichia coli* O157:H7 infections from hamburgers—Western United States, 1992-1993. *MMWR* April 16, 1993:258-63.

Griffin PM, Tauxe RV: The epidemiology of infections caused by *Escherichia coli* O157:H7, other enterohemorrhagic *E. coli*, and the associated hemolytic uremic syndrome. *Epi Rev* 1991;13:60-98.

Readers Give High Marks to *epiTRENDS*

Approximately 800 *epiTRENDS* readers returned the survey questionnaire included in the October issue. Responses came from a cross-section of health professionals, including 450 (58% of the total respondents) primary care providers, 154 (20%) professionals (including four elected officials) working in local, state, federal, and tribal

settings, and 71 (9%) university-level faculty and staff.

Most of you (88%) said you read *epiTRENDS* every month, and almost all (91%) rated the overall quality as "good" or "excellent." Similar proportions of survey respondents said that the information contained in *epiTRENDS* is clearly presented (93%) and is accurate and believable (91%). In contrast, close to 74% of respondents said that the information is useful in daily work. This proportion varied among professional groups, from a high of around 88% of local public health professionals to a low of around 70% for health care professionals working in private clinical practice and state and federal government settings.

Most of you (84%) said that *epiTRENDS* covers topics of interest to you, but with variation across topics (table). Almost all respondents expressed interest in infectious

TABLE: *epiTRENDS* Survey Respondents Interested in Specific Topic Areas

Topic Area	Percentage Expressing Interest
Infectious diseases	95.5
Chronic diseases	65.2
Environmental health	75.5
Injury/violence	57.3
Maternal and child health	61.1
General preventive medicine	82.6
Health services policy	54.6

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Monthly Surveillance Data by County

January 1998* – Washington State Department of Health

County	E. coli O157:H7	Salmonella	Shigella	Hepatitis A	Hepatitis B	Non-A, Non-B Hepatitis	Meningococcal Disease	Pertussis	Tuberculosis	Chlamydia	Gonorrhea	AIDS	Pesticides†	Lead\$#
Adams	0	0	0	0	0	0	0	0	0	4	0	0	0	0/#
Asotin	0	0	0	0	0	0	0	0	0	1	0	0	0	0/0
Benton	0	0	0	0	0	0	0	0	0	26	1	0	0	0/14
Chelan	0	0	0	0	0	0	0	0	0	1	0	0	0	2/14
Clallam	0	0	0	0	0	0	0	0	1	2	0	0	0	0/0
Clark	0	0	0	0	0	0	3	0	1	63	4	2	0	0/0
Columbia	0	0	0	0	0	0	0	0	0	0	0	0	0	0/0
Cowlitz	0	0	0	0	1	0	0	0	0	16	0	0	0	0/23
Douglas	0	0	0	0	0	0	0	0	0	2	0	0	0	0/0
Ferry	0	0	0	0	0	0	0	0	0	0	0	0	0	0/0
Franklin	0	0	0	0	0	0	0	0	1	11	0	0	0	0/#
Garfield	0	0	0	0	0	0	0	0	0	2	0	0	0	0/0
Grant	0	0	0	1	0	0	0	0	0	7	0	0	0	0/#
Grays Harbor	0	0	0	1	0	0	0	0	0	9	0	0	0	0/0
Island	0	0	0	0	0	0	0	0	0	4	1	0	0	0/#
Jefferson	0	0	0	0	0	0	0	0	0	0	1	0	0	0/0
King	0	0	0	0	0	0	0	0	3	254	74	13	2	0/20
Kitsap	0	0	0	0	0	0	0	0	0	17	0	0	1	0/23
Kittitas	0	0	0	0	0	0	0	0	0	2	0	0	0	0/0
Klickitat	0	0	0	0	0	0	0	0	0	2	0	0	1	0/0
Lewis	0	0	0	0	0	0	0	0	0	7	0	0	0	0/0
Lincoln	0	0	0	0	0	0	0	0	0	0	0	0	0	0/0
Mason	0	0	0	0	0	0	0	0	0	6	4	0	0	0/0
Okanogan	0	0	0	0	0	0	0	0	0	5	1	0	0	0/0
Pacific	0	0	0	0	0	0	0	0	0	1	0	0	0	0/0
Pend Oreille	0	0	0	0	0	0	0	0	0	0	0	0	0	0/0
Pierce	0	0	0	1	0	0	0	2	3	138	28	4	0	1/85
San Juan	0	0	0	0	0	0	0	0	0	2	0	0	0	0/0
Skagit	0	0	0	0	0	0	0	0	0	8	2	0	0	0/6
Skamania	0	0	0	0	0	0	0	0	0	0	0	0	0	0/0
Snohomish	0	0	0	3	0	0	0	0	1	57	7	0	0	0/5
Spokane	0	0	0	0	0	0	0	0	1	50	4	2	1	1/13
Stevens	0	0	0	0	0	0	0	0	0	2	0	0	0	0/0
Thurston	0	0	0	0	0	0	0	0	0	16	2	1	0	0/#
Wahkiakum	0	0	0	0	0	0	0	0	0	0	0	0	0	0/0
Walla Walla	0	0	0	0	0	0	0	0	0	24	1	0	1	0/5
Whatcom	0	0	0	0	0	0	1	0	0	15	2	0	2	0/#
Whitman	0	0	0	0	0	0	0	0	0	9	2	0	1	0/0
Yakima	0	0	0	0	0	0	2	0	1	46	3	0	0	4/16
Unknown														0/0

Current Month	0	0	0	6	1	0	6	2	12	809	137	22	9	8/241
January 1997	1	6	3	9	0	0	7	4	26	802	206	45	7	20/294
1998 to date	0	0	0	6	1	0	6	2	12	809	137	22	9	8/241
1997 to date	1	6	3	9	0	0	7	4	26	802	206	45	7	20/294

* Data are provisional based on reports received as of January 31, unless otherwise noted.

† Unconfirmed reports of illness associated with pesticide exposure.

\$# Number of elevated tests (data include unconfirmed reports) / total tests performed (not number of children tested); number of tests per county indicates county of health care provider, not county of residence for children tested; # means fewer than 5 tests performed, number omitted for confidentiality reasons.



WWW Access Tips

Web sites with information on *E. coli* O157:H7:

Washington State Department of Health —
<http://www.doh.wa.gov/topics/ecoli.htm>

Seattle-King County Department of Public Health —
<http://www.metrokc.gov/health/prevcont/ecoli.htm>

Children's Hospital and Regional Medical Center —
<http://www.chmc.org/infoline/ECOLI.htm>

Centers for Disease Control and Prevention —
<http://www.cdc.gov/ncidod/diseases/foodborn/e-coli.htm>

U.S. Food and Drug Administration —
<http://vm.cfsan.fda.gov/http://vm.cfsan.fda.gov/~mow/chap15.html>

USDA Publications —
<http://www.usda.gov/agency/fsis/pubconsu.htm>

Readers Survey (from page 2)

disease issues, but only a little more than half expressed interest in injury/violence and health services policy issues. These proportions were fairly consistent across professional groups, although public health professionals expressed more interest in injury/violence than did their colleagues working in primary care settings.

Your responses bolstered our confidence that we're providing the kind of information you want and need to improve your practice. Based on these results, we intend to strive harder to identify and provide current information on topics that

are important to the health of our fellow Washingtonians and that are relevant to your daily practice. Let us know, by letter or e-mail, what YOU would like to see in future issues of *epiTRENDS*.

Finally, we're pleased to announce that we have secured funding to continue publishing *epiTRENDS* through at least June 30, 1999. Virtually all of you (91%) indicated that you wish to continue receiving the bulletin by mail, so that will continue to be our principal means of distribution. Of course, we'll also continue to post *epiTRENDS* on the DOH home page.

Thanks for your support, comments and suggestions.

Updated Monograph on Lyme Disease Now Available On-line

Although reported only rarely in Washington, Lyme disease is the most common vector-borne disease in the United States and is a subject of considerable public concern. Limitations in available serologic tests place the burden of diagnosis on clinical evaluation. Diagnosis may be difficult, however, because Lyme disease can have multiple presentations and can resemble other diseases. Symptoms of localized disease typically include rash, erythema migrans, and a flu-like illness. Disseminated disease may produce musculoskeletal, neurologic, and cardiac findings. Chronic infection may result in arthritis and severe neurologic symptoms. Serologic studies can support the clinical diagnosis.

An updated Department of Health monograph on Lyme disease is now available on the home page of the University of Washington Northwest Center for Public Health Practice at: <http://healthlinks.washington.edu.nwcpHP//lyme>.

Conferences, Courses & Meetings

March 6, 20
Olympia
9 am–noon

Ambulatory/Outpatient Data Collection Feasibility Study — Technical issue group meeting on financing alternatives, March 9; Policy Advisory Group on March 20. Contact Hank Brown at 360-705-6000 for more information.

March 11
Richland
8:30–4:30

Rabies Prevention and Control Workshop — Final DOH workshop for local public health personnel, veterinarians, animal control officers, and others. Contact John Grendon at 360-586-5379 or jhg0303@hub.doh.wa.gov.

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